

GEMLAB Research Newsflash

!!! Very Important Laboratory Alert !!!

Alarming Rough Diamond Imitations in the Market

Until a few years ago rough diamonds were relatively rarely imitated because the market for rough diamonds was pretty much inaccessible for people not being members of the rough diamond trade. In the past 15 years rough diamonds from countries like Brazil, Russia and especially from certain African countries such as Sierra Leone, Guinea and Congo have become more and more accessible to almost anybody, or at least it is being pretended to anybody that this is the case. Together with this development increasing numbers of rough diamond imitations started appearing in the market, which are easily recognized by the experienced buyer, but that can appear very convincing for inexperienced buyers. Now recently large quantities of suprisingly naturally looking and convincing crystals imitating rough diamond have appeared in Europe.

By Thomas Hainschwang

Background information

Rough diamonds are generally simple to recognize based on their usually characteristic habit, their unique luster and their growth and dissolution figures; the classic crystal habits of diamond are the octahedron and the rounded dodecahedron, sometimes strongly distorted, with variably noticeable growth- and dissolution features (figure 1).



Figure 1: Natural rough diamond octahedrons (left and right) and a rounded dodecahedron (centre) with their typical strong lustre

Besides the general appearance the extremely high thermal conductivity of diamond is used as a characteristic property for this material (diamond has thermal conductivity approx. 5 x higher than silver); this property is what by far most commercial diamond testers are based on.

Obviously rough diamond imitations exist since a very long time, probably since diamond is traded, but in most cases the appearance of these materials has not much in common with diamond; usually the materials used are quartz, topaz or glass, rudimentarily worked to resemble somehow to diamond crystals and to fool tourists and inexperienced gemstone amateurs.

In the past years some short reports on perfectly shaped octahedrons, sometimes engraved with "dissolution figures" were reported in trade journals; these were usually made of topaz, CZ or glass and were likely part of small scale scams since such materials have, to our knowledge, not appeared in larger quantities in the trade in the past years.

Today the situation appears to be different, based on what the author has learnt directly on the spot in Sierra Leone from a local diamond trader who had a hand full of imitation diamond octahedrons made of glass in his possession; according to the dealer such glass octahedrons are produced in non-negligible quantities by Chinese manufacturers in Freetown, the capital of Sierra Leone. The imitations shown by this diamond dealer were well made, but not very convincing for an expert.

The phenakite / topaz scam

Now recently a stone was analyzed in the Gemlab laboratory that was sold as diamond in its rough state. After cutting the sample was offered as a "diamond-like gem material". This conclusion was drawn by the owner of the sample, because the stone had been tested with several diamond testers, and was identified by all these thermal probes as diamond; nevertheless the appearance of the brilliant cut stone was very different than diamond, and the cutting showed that the sample was not diamond. In our laboratory the stone was analysed by specular reflectance infrared spectroscopy and identified as phenakite, a relatively rare beryllium silicate.

To confirm the claim that the material indeed indicates diamond when tested by the thermal diamond tester, the sample was measured several times with the diamond-/moissanite tester of the owner and indeed the probe identified the stone as "diamond" in every test.

A few weeks after this event the author had the opportunity to analyze a parcel of nearly 2000 ct in Portugal, that was supposed to consist of large (above 4 ct, average about 9 ct) high quality rough diamonds. The stones were exceptionally colourless and clean octahedrons and rounded dodecahedrons with distinct growth motifs; there were also some flattened octahedrons in the parcel, which looked like typical diamond macles (Figure 2).



Figure 2: Part of the stones offered as rough diamonds – perfect octahedrons and rounded dodecahedrons

The stones appeared immediately suspicious since the lustre of the crystals was noticeably below the lustre of diamond and since none of the samples showed the typical dissolution motifs (such as so-called "trigons") besides the apparent growth features (Figure 3). Some crystals showed some areas with small chips, that appeared distinctly conchoidal; this stands in stark contrast to diamond, where chipped surfaces always appear step-like due to their perfect cleavage. It was thus evident that the parcel did not consist of diamonds, but of ingeniously designed, polished and engraved imitations.



Figure 3: The details of some of the crystals shown in figure 2.

Since on the location the necessary instruments to identify the stones with certainty were not available it was necessary to collect as much evidence as possible to get an idea about the identity of this material. In one perfectly octahedral crystal an internal cleavage was observed, that did not follow any of the octahedral directions (Figure 4). In diamond this is crystallographically impossible, because the perfect cleavage in diamond always follows the four directions of the eight octahedral faces.



Figure 4: A perfect octahedron that showed an internal cleavage not following any of the octahedral faces, which is crystallographically impossible in diamond.

With a loupe many veils mainly consisting of liquid as well as bi-phase liquid/gas inclusions, and irregular cracks, often with obvious interference colours, were observed. This inclusion scenario is typical for minerals grown under hydrothermal conditions, but is impossible in diamond. With the loupe a slight double refraction could be determined, that was consequently confirmed by the reaction of the crystals under crossed

polarizing filters. The collected data indicated phenakite or maybe topaz as the most likely candidates; since the discovery of large phenakite crystals in Madagascar this mineral is currently available in appreciable amounts and for rather low prices. This also explains the appearance and misrepresentation of such material a few weeks before this large parcel was encountered.

The educated guess that the stones were phenakite, or possibly also topaz, or both, was substantiated the following day, because a dealer we visited had bought a stone from the same group, which he had tested as a precaution with a thermal diamond tester: the tester indicated that the material was diamond. Upon inspection of the sample it was discovered that the crystal was the same convincing imitation material that was analyzed the day before.

Another possibility for at least part of the material would be topaz, since it also shows cleavage and since topaz is also known to sometimes fool the thermal testers.

Concluding remarks

These rough diamond imitations are so perfectly and ingeniously made, that they will likely convince some buyers of their pretended identity; the fact that the material is falsely identified as diamond by certain diamond testers will certainly help that this scam will have even more success.

Why certain diamond and diamond/moissanite testers do not reveal this material is most likely due to the low sensitivity of some of the probes. The thermal probes do not measure the thermal conductivity but the thermal inertia; the measured value of thermal inertia is much closer between diamond and all other materials than the real value of thermal conductivity.

It is currently not clear who exactly is responsible for this large scale diamond scam, but the nearly 2000 ct of stones falsely represented as diamonds were offered by dealers from southwest African countries. It is unknown who produces these tricky and convincing diamond imitations.



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